HALEAKALA NATIONAL PARK CRATER DISTRICT RESOURCES BASIC INVENTORY: THE VASCULAR FLORA OF HALEAKALA

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Haleakala includes one of the four alpine ecosystems in the Hawaiian archipelago (the other three being located on the island of Hawai'i). Its flora has been studied by numerous botanists since the first collections in this area were made by members of the United States Exploring Expedition in 1841. Hawaiian alpine ecosystems (only one of the Park's vegetation types) have been recognized in the past as having a high percentage of endemic species (Skottsberg 1931)--plants that grow nowhere else--and even now, despite the presence of numerous exotic species in the Park and the extinction of native taxa (both a result of past and present disturbances), the Park's flora exhibits a large number of endemic species (Table 1).

The Haleakala National Park Crater District Resources Basic Inventory (RBI) integrated research program was undertaken to provide a biological inventory of the Park, and to identify resource management problems. When this report, currently in the final stages of preparation, is finished, a computer print-out will be available which will provide the following information.

1) A general catalogue of the species with notes on general abundance and distribution within the Park, and their status (Indigenous, Endemic, Exotic) within the State;

2) Inclusion of any of the species in any of the Rare and Endangered Species Lists (Fosberg & Herbst 1975; U. S. Fish & Wildlife Service 1976) or the State's noxious weed list (Office of Environmental Quality Control 1972, revised 1976);

3) Scientific, English, and Hawaiian names (when known).

Use of the computer for storage of information facilitates updating the list as new information is gathered.

In addition to an inventory of plants found in the Park, voucher specimens have been collected as reference material for Park personnel with some duplicate materials to be distributed to the Bishop Museum (BISH) and University of Hawaii (HAW) herbaria.

The last comprehensive review of the Park's flora was prepared by Mitchell (1945). Ruhle (1959 revised 1968, 1975) presented a good review of the natural history, but gathered no new information on the Park's flora or vegetation. Our studies during the years 1975-1978 have resulted in the listing of many more species for the Park than previously known, although certain genera, for which Mitchell listed numerous species and subspecific taxa, are not so finely circumscribed. For instance, 17 taxa were recorded by Mitchell for the genus Railliardia, while far fewer are considered in our recent compilation. In such instances this is due to a more conservative interpretation of taxonomically difficult groups, rather than extinction. Unfortunately certain taxa, such as Clermontia haleakalensis, are probably extinct, while others, such as Hillebrandia and Ranunculus, previously reported from the Crater region, are now confined to Kipahulu Valley and Ko'olau Gap.

Over the 30 years between Mitchell's study and the present one, there has been little change in the flora of the Park, but some of those changes are well worth mentioning. Several species which have the potential of being aggressive weeds were not noted by Mitchell (1945). While some of these may have been overlooked (a problem all too familiar to anyone who has attempted to compile species lists), others are no doubt relatively recent introductions. These, and others which were previously reported from the Park and should be considered problematic, are listed in Table 2. Some of these species are officially considered "noxious weeds" (as indicated), but many are not, and only a few are presently under Park management. At present, a number of species with localized populations should be contained to prevent their spread throughout the Park. Table 2 does not include all the weedy species in the Park, but only those which are thought to be most in need of control and not those already hopelessly out of control.

A few rare or new species not previously noted from the Park were located including: Panicum sp. (undescribed); Dryopteris palikuensis (nom. prov.); Bidens sp. (sterile--probably undescribed); Plantago princeps C. & S. var. laxifolia Gray; and Lepechinia hastata (Gray) Epling (previously recorded near Park boundaries).

In conclusion, certain taxa present in the Park are endemic not only to Hawaiian alpine and subalpine ecosystems, but to Haleakala proper such as Artemisia mauiense, Argyroxiphium macrocephalum, Stenogyne crenata (2 varieties), Geranium cuneatum, G. arboreum, Santalum haleakalae, and others. The deleterious effects of feral goats on certain vegetation types within the Park (especially in areas more-or-less inaccessible to hunters) cannot be overemphasized. Since many of the endemic species are of limited distribution, they should be considered threatened by the continued presence of goats. Delays in the implementation of an effective goat control program must be considered a serious threat to the native biological resources of Haleakala National Park.

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TABLE 1. Percentages of the indigenous, endemic, and exotic vascular plant flora of Haleakala National Park Crater District.

	Pteridophytes	Monocots	Dicots	Total
Indigenous	44	13	2	11
Endemic	54	28	51	46
Exotic	2	59	47	43

TABLE 2. Potentially aggressive weeds in Haleakala National Park Crater District.

Species	Status	Distribution in Park
Cirsium vulgare (Savi) Tenore	1,2	Present especially in heavily goat infested areas.
Eupatorium adenophorum Spreng.	*,2,4	Maui pamakani is found in several large populations at mid-elevations in the Park such as at kipuka S of Laie cave, and S of Hanakauhi. It probably is no longer spreading but nevertheless should be controlled.
Eupatorium riparium Spreng.	*,2,4	This species is recorded from the Hosmer Grove area, and while potentially dangerous in lower elevations it is probably not a threat in the Park but should be watched.
Lantana camara L.		Though probably not a problem or even a potential problem above 5000 feet in the Park, the presence of Lantana at low elevations in Kaupo Gap within the Park should be watched carefully and controlled when practical.
Opuntia megacantha Salm-Dyck	1?, 3,4	Panini is presently known from only two small populations in mid-lower Kaupo Gap, and near Laie Cave. It is probably under control within the Park.

TABLE 2—Continued.

Species	Status	Distribution in Park
Passiflora subpeltata Ortega	2,4	A few plants were noted along Kaupo Trail, and while the populations are currently not a problem any detected plants of this genus should be controlled.
Pennisetum clandestinum Hochst. ex Chiov.	2,4	Kikuyugrass is found along trails and roads throughout the Park, and at low elevations along Kaupo Trail it is the dominant cover species.
Pinus spp.	1,2, 3?	Certain pines and other gymnosperms have spread from their planting sites, notably near Hosmer Grove. Aggressive species should be controlled.
Poa pratensis L.	2,4	The Kentucky bluegrass is common in damp areas throughout the Park, such as under trees. It is replacing the native *Deschampsia* grassland in Kaluanui, and work should be done to find a means of controlling its spread.
Ricinus communis L.	2,4	A large community of castor bean is found along and to the east of the Kaupo Trail near the boundary of the Park.
Rubus penetrans Bailey	*,2,4	The prickly Florida blackberry has become a nuisance in the Paliku Horse Pasture, could spread elsewhere in the Park. It is high on the list of species needing immediate control.

Rubus rosaefolius Sm.	2	The thimbleberry is found occasionally in lower east Kaupo Gap in damp shaded areas; though perhaps not in danger of spreading its populations should be watched.
Schinus terebinthifolius Raddi	2,4	A single specimen of Christmas berry was seen in the goat-ridden western part of Kaupo Gap; elevation ca. 4400 feet. It should be removed.
Ulex europaeus L.	*,1,4	Degener (1930) reports that gorse was planted as a hedge in Olinda to contain sheep but within a decade of it being planted it had become a pest. At one time territorial prisoners were employed to eradicate this plant. Within the Park it is only known from a small patch below Park Headquarters.

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* Included in the State's noxious weed list

1 Currently being controlled by Park personnel or volunteer groups

2 Species not presently controlled which are in need of control by the Park

3 Biocontrol agents available but apparently not presently effective

4 Not included in Mitchell's species list

Note: those species thought to be "hopelessly out of control" in the Park, or at least have probably reached their greatest distribution with little probability of control are not listed but include Anthoxanthum, Caryophyllaceae spp., Dactylis, Heterotheca, Holcus, Hypochaeris, Lapsana, Rumex acetosella, etc.